

AMENDMENTS TO THE SPECIFICATION

Replace the entire text of the SUMMARY OF THE INVENTION beginning on page 3 of the specification with the following amended Summary:

C [A feature of the invention is to provide a multiple air cell arrangement providing both ergonomic lumbar support and surface movement can be configured to provide both health and comfort air cell units and can be configured for filling various requirements of vehicle types.] A vehicle occupant support apparatus is provided for installation in a vehicle seat. The apparatus comprises an array of air cells including expandable chambers and a control module. The control module has an input connectable to a fluid supply system and includes only enough outputs to connect respective cells of a portion of the array to the fluid supply system via the control module. This allows the array of air cells to be conformed to any one of a plurality of different vehicle types by connecting to the limited number of outputs only those cells that are appropriate or intended for use in a given vehicle type.

[A further feature is to provide such systems wherein an air cell array can be provided to meet one or more vehicle type requirements and where in the choice of which air cells to activate can be made at a dealership through amass customization.] According to another aspect of the invention the apparatus comprises an array of air cells including expandable chambers and a control module for connecting the air cells to a fluid supply system. The control module includes a controller, a pump, and a wiring harness connected to the controller. The controller is selected from among a plurality of different function controllers configured to operate the occupant support apparatus according to different respective user preferences. This allows different function controllers to be selected and installed to provide different types of control for the array.

[A still further feature is to provide a seating module and controller that can provide bundled control module and air cell zone combinations including 2-zone

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combinations having seat S2/L5 air cell combinations; I/ L5/3 air cell combinations; seat S2/SBB air cell combinations; I/seat S2 air cell combinations; L5/3/SBB combinations; I/SBB; I/CBB; RT/LT. Three zone combinations can include (S2,L5,L3); (S2, L5/3. SBB); (L5/3,SBB,I); L5/3,SBB,CBB); (I,RT,LT);(I,SBB,CBB); (RT,LT,CBB). Four zone combinations can include (S2,L5,L3,SBB); (S2,L5/3,SBB,CBB); (S2, L5/3,LT,RT); (I, LT,RT,L5/3) and(I,LT,RT,S2).

Codes for each of the aforescribed air cell zone and combinations are as follows:

I-Ischial

SBB-Seat back bolster side air cells

CBB- Cushion bolster side air cells

RT- Right thigh support air cell

LT- Left thigh support air cell

S2- Iliac support air cell

L5 - Lower lumbar support air cell

L3 - Middle lumbar support air cell] According to another aspect of the invention the control module is programmed to have target pressures attained by using a programmed time of inflation or deflation of the expandable chambers as established by desired program sequences of operation by the control module. This type of automatic control of the air cell pressures eliminates the need for a feedback function such as the use of pressure transducers for indicating full inflation or deflation of the air cells.

[The packaging of such air cells and control module enables the supplier to control the function and operational packages on a health and performance basis based upon desired objectives that they are designed to satisfy. Thus, air cells positioned to support the ischial and lumbar and seat iliac of a user can satisfy health features including posture and circulation; bolster and seat features can satisfy high performance vehicle seating requirements; and seat and thigh support features can satisfy comfort requirements. Combinations of health, comfort and performance are also possible.] According to another aspect of the invention the valves are provided and the control

module is programmed to have a programmed time of inflation or deflation established by sequentially activating the valves individually and energizing the pump for predetermined periods, and varying the number and location of the expandable chambers pressurized producing localized pressures exerted on a supported member. This feature allows for a greater variety of uses.

[More particularly a system is configured to provide both support of an occupant for seating comfort or to improve user health by spinal and pelvic adjustments.] According to another aspect of the invention the apparatus includes a pressure source and an exhaust system configured to provide a pneumatically controlled support surface for the seating or body support system. Also, the massage movement includes a sequence of inflate and deflate between the respective expandable chambers so as to provide concentrated massage while maintaining a directional movement of the expandable chambers producing the massage action.

[The invention includes one or more air cells preferably located in a seat back but suitable for use in other locations of an occupant support system. In one embodiment the air cells are three in number with each cell connected to a separate vent (bleed) valve and to a separate fill valve to allow for simultaneous inflation and deflation of each of the cells.] According to another aspect of the invention the expandable chambers are provided as a series of expandable chambers and more than one user selected massage type is provided. Also provided is a preprogrammed manner of individual expandable chamber inflation and deflation to produce either a pulse type control of individual expandable chambers in both inflate and deflate steps through the series of expandable chambers so as to produce the aforesaid concentrated massage action.

[In addition to the posture-establishing ergonomic control function of the three air cells, they are associated with a controller that includes a circuit board with a plurality of switches for selectively controlling the operation of a microprocessor to

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initiate either manual pressure control of the air cells or to initiate a massage action.] According to another aspect of the invention the apparatus includes an inflate switch and a deflate switch and the control sequence is initiated by signals from the inflate and deflate switches to the controller. Also, a manual inflate or deflate control is established by inputting the controller with input signals from manual operation of the inflate or deflate switches. The controller is preprogrammed to provide a timed inflate and exhaust of the expandable chambers.

[An automatic massage control is initiated by a microprocessor in response to control signals from a combination of manual control switch techniques as follows:

Technique 1

Single, momentary, push-button switch with a toggle function. Pushing switch once initiates massage, pushing switch a second time halts massage.

Technique 2

Two position, momentary rocker switch. Pushing one side of switch turns massage on and pushing the other side of the switch turns massage off.

Technique 3

Embedded switch function: pressing two switches at one time initiates massage and pressing the opposite two switches halts massage, e.g., press inflate zone 1 and inflate zone 2 simultaneously to start massage and press deflate zone 1 and deflate zone 2 simultaneously to halt massage.

In all cases, when massage is halted, either through timing out or by the user selecting the proper switch(es), the system performs a deflate all and then inflates the support zones to their setting before massage is initiated. When massage is initiated, all zones are deflated before the actual massage sequence begins.] According to another aspect of the invention the apparatus includes a lower lumbar expandable chamber, an upper lumbar expandable chamber and a middle expandable chamber. The pressure source and exhaust system are controlled by an automatic controller controlled sequence of massage. The sequence of massage includes fully inflating the lower lumbar expandable chamber; then transferring

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the air from such lower lumbar expandable chamber to the upper lumbar expandable chamber and then to the middle or third expandable chamber and following such inflation deflating each of the multiple expandable chambers from the upper expandable chamber down to the lower expandable chamber and repeating the aforesaid automatic massage for a timed period.

[For massage intensity, a two-position momentary rocker switch is used. The options are to increase or decrease massage intensity. Increasing massage intensity, increases the inflation/deflation time to increase the resulting pressure in the cells but also slows the progress from one cell to the next. Decreasing massage intensity, decreases the inflation/deflation time to decrease the resulting pressure in the cells and also speeds the progress from one cell to the next. The speed impact is a byproduct of the intensity changes while the pressure increase/decrease is the goal of the change.] According to another aspect of the invention the switches are configured to stop the automatic massage action when depressed for a predetermined period of time.

[The automatic massage sequence can embody various options, versions, modes provided by a microprocessor program that will selectively operate the fill and vent valve of each air cell to inflate and exhaust the multiple air cells in a stepped fashion at a fill and exhaust period for each air cell in a range for producing a rapid pulse of each of the air cell surfaces in sequence. The fill and exhaust periods are application specific and depend on the size (volume) of the cells, the length of the hoses and the cell position relative to the seat surface. As currently configured, the time's range from 0.25 second to 5 seconds. However, the maximum time may be increased for other applications, e.g., home seating.] According to another aspect of the invention the apparatus includes sensors and other switches and a controller operative in response to multiple input signals. The input signals that the controller responds to include one or more of an occupant detection condition; a temperature condition; system power-up; on-off switch and a system override switch.

[A system of inflatable air cells is constructed and installed in a seat at locations which are strategic to the comfort of the user. The air cells are connected to a pump through a feed manifold and valve arrangement. In one embodiment, the valve arrangement can include a dual valve for each air cell comprising a fill valve and a vent valve for each air cell to simultaneously or sequentially, as desired, connect each cell to the pump while simultaneously exhausting one or more of the cells to a vent. The dual valve arrangement controls the flow of fluid in the air cell distribution system to produce rapid individual cell to cell pulse or a rapid individual cell to cell wave action wherein the massage movement includes a microprocessor program controlled sequence of inflate and deflate between the respective cells so as to provide a rapid concentrated massage action. The automatic control of the air cell pressures eliminates the need for a feedback function such as the use of pressure transducers for indicating full inflation or deflation of the air cells. Rather target pressures are attained using a programmed time of inflation or deflation of the air cells as established by desired program sequences of operation by a microprocessor.] According to another aspect of the invention the apparatus includes a pressurized manifold and dual valves disposed between the pressurized manifold and the one or more expandable chambers. The valves are configured to control air flow from a supply manifold or to exhaust the one or more expandable chambers.

[A microcomputer's non-volatile memory is programmed with data representing a desired massage type and level for the air cells. By sequentially activating each set of dual valves and energizing the pump motor for predetermined periods, and by varying the number and location of the cells the system is time responsive to produce rapidly adjusted localized pressures exerted on the body for a great variety of uses. Additionally, in accordance with the present invention, air cells forming the contouring elements of the seat back and seat bottom have their pressure controlled at a frequency that will produce the desired massage effect.] According to another aspect of the invention the pressure source includes a pump supplying the manifold. The pump is operable during exhaust from the one or more expandable chambers to back pressure the manifold.

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[One feature of the present invention is to provide the system of the preceding objects wherein the control sequence is under a microcomputer control and wherein a manual inflate or deflate control is established by inputting the microcomputer with input signals from manually operated inflate or deflate switches and wherein the microcomputer is preprogrammed to provide a timed inflate and exhaust of the air cells.] According to another aspect of the invention the apparatus includes at least first second and third expandable chambers. Also, the controller is configured to provide a massage sequence including deflating all of the expandable chambers, connecting the pressurized manifold to the first expandable chamber, deflating the first expandable chamber while inflating the second expandable chamber, deflating the second expandable chamber while inflating the third expandable chamber, deflating the third expandable chamber while inflating the second expandable chamber and deflating the second expandable chamber, and repeating the aforesaid massage sequence.

[A further feature of the present invention is to provide the system of the preceding object wherein the massage control sequence is under a microcomputer control and wherein an automatic control sequence is established by input signals from manually operated inflate or deflate switches and wherein the microcomputer is preprogrammed to provide a timed inflate and exhaust of the air cells.] According to another aspect of the invention the apparatus includes at least first second and third expandable chambers and the controller is configured to provide a massage sequence including deflating all of the expandable chambers, connecting the pressurized manifold to the first expandable chamber to inflate the first expandable chamber, deflating the first expandable chamber while inflating the second expandable chamber, deflating the second expandable chamber while inflating the third expandable chamber deflating the third expandable chamber and repeating the aforesaid massage sequence.

[A preferred embodiment utilizes three to four cells in the lumbar area to set an optimal pelvic angle and provide support for the spine and then flex the spine to exercise (pump out waste materials).] According to another aspect of the invention the

control module includes a controller and a pump and the occupant support apparatus includes hoses connected at one end to respective individual expandable chambers of the array and connectable at respective opposite ends to the control module.

According to another aspect of the invention a method is provided for customizing a vehicle occupant support apparatus to suit a particular vehicle application. The method includes providing a vehicle occupant support apparatus including an array of air cells including expandable chambers configured to be carried by a vehicle seat, a controller connected to the air cells, and a fluid supply system connectable to the air cells through the controller; selecting from among the air cells of the array, those air cells suited to a desired vehicle seat application; and disconnecting all but the selected air cells from the controller. According to this method, an array of air cells can be conformed to any one of a plurality of different vehicle types by disconnecting from the controller all but those cells that are appropriate or intended for use in a given vehicle type.

According to another aspect of the invention a method is provided for customizing a vehicle occupant support apparatus to suit a particular vehicle application. The method includes providing a vehicle occupant support apparatus including an array of air cells including expandable chambers configured to be carried by a vehicle seat, a controller connectable to the air cells, and a fluid supply system connectable to the air cells through the controller; selecting from among the air cells of the array, those air cells suited to a desired vehicle application; and connecting the selected air cells to the controller. According to this method, an array of air cells can be conformed to any one of a plurality of different vehicle types by connecting to the controller only those cells that are appropriate or intended for use in a given vehicle type.

Replace the first paragraph on page 10 with the following amended paragraph:

C₂ The seat system indicated by reference numeral 112 in Figure 8, includes lumbar air cells 114, 116 and a seat air cell 117 for supporting the iliac region of a user. The pressure in air cells 114, 116 and 117 is controlled by control module 110 when connected thereto for providing touring comfort operation as might be desired in an SUV. The control module 110 is connected by tubing or hoses 110a to the air cells and includes a pump 110b and a wiring harness 110c that will be connected to a single controller [control module] 110d or if the system is fully modularized to one of a plurality of different types of schematically shown controller selection choices 110d-110g depending upon the control function selected.